THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

Paper No. 14

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte TIEN-HENG CHIU and MICHAEL D. WILLIAMS

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Appeal No. 1997-3303
Application No. 08/171,126

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ON BRIEF

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Before THOMAS, BARRETT, and LEVY, ***Administrative Patent Judges.***

LEVY, ***Administrative Patent Judge.***

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 2-6 and 8-13, which are all of the claims pending in this application.

BACKGROUND

Appellants' invention relates to a method for fabrication of wavelength selective electro-optic grating for DFB/DBR lasers. An understanding of the invention can be derived from a reading of exemplary claim 12, which is reproduced as follows:

12. A method for the fabrication of a laser structure including a wavelength selective electro-optic grating which comprises the steps of

(a) depositing a first n-type contact layer upon the surface of a semi-insulating or doped III-V semiconductor substrate,

(b) depositing a waveguide upon the n-type contact layer,

(c) depositing a second n-type contact layer upon the waveguide,

(d) depositing an active layer upon the said second n-type contact layer,

(e) selectively etching the active layer down to the waveguide layer in a region of the structure designed for formation of a grating,

(f) depositing a conductive material on the resultant structure, and

(g) patterning said conductive material to form electrodes in the shape of a grating.

The prior art references of record relied upon by the examiner in rejecting the appealed claims are:

Tokuda et al. (Tokuda)	4,843,032	June 27, 1989
Okai et al. (Okai)	4,885,753	Dec. 5, 1989
Blonder et al. (Blonder)	5,158,908	Oct. 27, 1992

Sakata et al, (Sakata) 5,233,187 Aug. 3, 1993

Claims 2-4, 6, 8, 10, 12 and 13 stand rejected under 35 U.S.C. § 103 as being unpatentable over Sakata in view of Okai.

Claim 5 stands rejected under 35 U.S.C. § 103 as being unpatentable over Sakata in view of Okai and further in view of Blonder.

Claim 9 stands rejected under 35 U.S.C. § 103 as being unpatentable over Sakata in view of Okai and further in view of Angelopoulos.

Claim 11 stands rejected under 35 U.S.C. § 103 as being unpatentable over Sakata in view of Okai and further in view of Tokuda.

Rather than reiterate the conflicting viewpoints advanced by the examiner and the appellants regarding the above-noted rejections, we make reference to the examiner's answer (Paper No. 13, mailed July 3, 1996) for the examiner's reasoning in support of the rejections, and to the appellants' brief (Paper No. 10, filed December 14, 1995) and revised brief (Paper No.12, filed February 12, 1996) for the appellants arguments thereagainst.

OPINION

In reaching our decision in this appeal, we have given careful consideration to the appellants specification and claims, to the applied prior art references, and to the respective positions articulated

by the appellants and the examiner. As a consequence of our review, we will reverse the rejection of claims 2-6 and 8-13 under 35 U.S.C. § 103.

The examiner has failed to set forth a ***prima facie*** case. It is the burden of the examiner to establish why one having ordinary skill in the art would have been led to the claimed invention by the express teachings or suggestions found in the prior art, or by implications contained in such teachings or suggestions. ***See In re Sernaker***, 702 F.2d 989, 995, 217 USPQ 1, 6 (Fed. Cir. 1983).

At the outset, we will clarify the record as to language found in the claims before us on appeal. We note that the language "selectively etching the active layer down to the waveguide layer" in step (e) of claim 12 is inconsistent with the method set forth in steps (b), (c), and (d) of the claim. Step (b) sets forth that a waveguide is deposited upon the n-type contact layer. Step (c) sets forth depositing a second n-type contact layer upon the waveguide. Accordingly, the active layer itself cannot be etched down to the waveguide. Rather, both the active layer and the second n-type contact layer must be etched away for the waveguide to be exposed. In light of the disclosure (page 1, lines 6-8), we construe the limitation as requiring etching of both the active layer and the second n-type layer to expose the waveguide in the region of the structure designed for formation of a grating. In addition, we note that the term "electrodes" found in amended claim 12 does not appear anywhere in the disclosure as filed[1]. We agree with appellant (amendment B, Paper no. 5, filed March 13, 1995, page 3) that the

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[1] The examiner (Office action, Paper no. 3, mailed on December 23, 1994) appears to make inconsistent statements regarding the term "electrodes." In this Office action, the examiner objected to the specification, and

grating (17) is a conductive material and is capable of serving as an electrode, particularly in view of the language found in the specification (page 9, lines 2-7) relating to applying a difference of potential accross the cladding, and controlling the refractive index by regulation of the voltage bias. Accordingly, we construe the phrase "electrodes in the shape of a grating" set forth in claim 12 to refer to grating (17) being capable of serving as an electrode. We further note that claims 10 and 11, both of which depend from claim 12, each state "wherein the cladding comprises. . . ." We find that claim 12 does not refer to cladding. Thus, there is a lack of antecedent basis for "cladding" in claims 10 and 11.

Turning to claim 12, the only independent claim in the application, the issue before us is whether the prior art references to Sakata and Okai suggest the specific steps for fabricating the laser structure set forth in the claim.

Appellants assert (revised brief [hereinafter: rbrief], page 9) that absent from Sakata is a disclosure of the concept of the formation of a grating by periodically modulating the index of refraction

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rejected all of the claims, under 35 U.S.C. §112(1) on the basis that "nowhere in the specification is it mentioned that electrodes themselves are patterned into a grating, and that layer 17 comprises electrodes" and on the next page of the same Office action the examiner suggested that appellant modify the independent claim to include "patterning said conductive material to form electrodes in the form of a grating" in order to overcome a rejection of the claims under 35 U.S.C.

§ 112(2). In the subsequent Office action (final rejection, Paper no. 6, mailed April 19, 1995, the examiner repeated the objection to the specification and once again rejected all of the claims pending in the application under 35 U.S.C. § 112(1) on the same grounds as the previous Office action. Appellant subsequently filed amendment C (Paper no. 7, filed on July 21, 1995) in which appellant attemped to delete the term "electrodes" from claim 12. The examiner (advisory action, Paper no. 8, mailed August 22, 1995) refused entry of the amendment based upon other reasons, but noted that the objection to the specification and rejection of all of the pending claims under 35 U.S.C. § 112(1) was withdrawn, without explanation. Appellants' arguments regarding the term "electrodes" had not changed from their previous statements in the record.

of a waveguide cladding. The examiner takes the position (answer, page 7) that claim 12 does not recite cladding material, and that "formation of a grating by periodically modulating the index of refraction of a cladding material" is not found in any of the claims.

As pointed out by our reviewing court, "[T]he name of the game is the claim." ***In re Hiniker Co.***, 150 F.3d 1362, 1369, 47 USPQ2d 1523, 1529 (Fed. Cir. 1998). Claims will be given their broadest reasonable interpretation consistent with the specification, and limitations appearing in the specification are not to be read into the claims. ***In re Etter***, 756 F.2d 852, 858, 225 USPQ 1, 5 (Fed. Cir. 1985).

We are in agreement with the examiner that appellants do not claim "formation of a grating by periodically modulating the index of refraction of a cladding material." Claim 12 is drawn to a method for the fabrication of a laser structure including wavelength selective electro-optic grating. The claim is not drawn to the operation of the fabricated device. While we are cognizant that in operation, the index of refraction of a cladding material or the waveguide itself is modulated to alter the wavelength of the generated light in the feedback region, these limitations do not appear in the claims pending before us on appeal. Appellants further assert that absent from Sakata is a teaching of periodicity being established by means of conducting media strip lines through which current is passed or an electric field established between the lines. We note that this limitation regarding media strip lines is not found in claim 12, nor in any of appellants' claims.

The examiner asserts (answer, page 9) that "Sakata teaches every limitation of claim 12 save for the grating shaped electrodes." We disagree. The examiner states (answer, page 3) that "Sakata teaches . . . forming an n-type contact layer (102), a waveguide layer (103), a second n-type contact layer (104) and an active layer (105)." To this extent, we agree with the examiner. However, the next step set forth in the method of claim 12, step (e), requires "selectively etching the active layer down to the waveguide layer in a region of the structure designed for formation of a grating." We find that in Sakata, while active layer (105) is removed by etching, the etching process does not etch down to the waveguide layer as claimed. In order to reach the waveguide (103), the cladding layer (104), which the examiner relies upon as the second n-type layer, would also have to be etched away in the region of the structure designed for formation of a grating. This is not done in Sakata, who does not expose waveguide (103). Accordingly, step (e) of method claim 12 is also not met by Sakata. In addition, step (f) of the method of claim 12 sets forth depositing a conductive material on the resultant structure, which is the waveguide (103). As there is no etching of the cladding layer (104) down to the waveguide (103), there is also no depositing of a conductive material on the surface of the waveguide after etching away the active layer and the second n-type layer to expose the waveguide. Additionally, we note that the conductive layer that is deposited on the waveguide in step (f) of the method of claim 12 is the same conductive layer that forms the electrodes in the shape of a grating in step (g). Accordingly, step (f) of the method of claim 12 is also not met by Sakata. With regard to step (g) of

the method of claim 12, the examiner states (answer, page 4) that "Sakata does not teach to make a top electrode in the shape of a grating." Accordingly, step (g) of the method of claim 12 is also not met by Sakata.

The examiner relies upon Okai for a suggestion of fabricating electrodes in the form of a grating. The examiner asserts (answer, page 4) that in Okai, electrode (107) is patterned in the shape of a grating in the feedback region (113). Appellants assert (rbrief, page 10) that the separate electrodes are used to vary the light intensity distribution in feedback region (113), but that while the electrodes look like a grating, they are not. The examiner responds (answer, page 8) by noting that all that is claimed is that the electrodes are in the shape of a grating. From our review of claim 12, we note that the language found in the preamble "including a wavelength selectable electro-optic grating" cannot be ignored as we find that it breathes life and meaning into the claim by defining characteristics of the grating that is being fabricated. We find, however, that Okai does meet the requirement that the electrodes patterned into the shape of a grating that provides electro-optic wavelength selection. Okai discloses (col. 2, lines 18-36) that the feedback region is optically coupled with the active region for varying the wavelength of the fed-back light by a plurality of structural parameters. The perturbation portion is one of the structural parameters. In addition, the intensity of the electric field applied to the feedback region is another of the structural parameters. By combining these parameters, the wavelength range is enlarged. This occurs because of coupling of the light propagated in the feedback

region with a part of the perturbation portion. Okai goes on to state (col. 2, lines 40-44) that the plurality of separate electrodes formed on the feedback region so as to correspond to different areas of the perturbation portion, can be used as the above-mentioned structure. This is best shown in figures 7A and 7B. Figure 7A shows (col. 6, lines 22-32) light distribution as hatched region (715) in response to a uniformly applied electric field. Okai specifically states (col. 6, lines 32-40) that:

> When the voltage is applied to one of the separate electrodes **707** or the current supplied to the electrode is varied to change the refractive index of that part of the optical guide layer **706** which corresponds to the above electrode, the light intensity distribution in the feedback region is varied as shown in **FIG. 7B**, and thus the degree of coupling of light traveling in the feedback region with that part of that perturbation portion **711** which corresponds to the electrode, is varied.

Appellants argue (rbrief, page 11) that at most, Okai can be viewed as disclosing the formation of a sectional grating which is a physical grating, and that appellants do not physically form a grating but instead disclose the formation of an electro-optic grating. Appellants' statement that they do not "physically form a grating" is inconsistent with the specification which discloses (page 7, lines 18-20) that "a conductive material is deposited upon the cladding region 16 in the form of a grating 17 as shown in Fig. 8 by photolithographic techniques." We believe that appellants meant to state that the instant invention replaces the corregated gratings found in Sakata and Okai with an electro-optic grating that eliminates the need for a corregated grating by applying a difference of potential across the cladding or waveguide that results in the preparation of a grating of controlled refractive index, with the control being obtained by regulation of the voltage bias (specification, page 9). However, in view of Okai's

teaching that the voltage applied to one of the electrodes can be varied and that the voltage applied to an electrode in the feedback region is one of the structural parameters for altering the wavelength of the fed-back light, we find that Okai teaches electrodes formed in the shape of a grating that can electro-optically alter the wavelength of the light in the feedback region, to the extent claimed by appellants. Claim 12 does not exclude the use of additional structural parameters such as a perturbation portion.

Appellants further assert (rbrief, page 10) that as claimed by appellants, the distance between the conductive strips must be comparable to the wavelength of the desired structure. We are in agreement with the examiner (answer, paragraph bridging pages 7 and 8) that this limitation is not claimed.

We are in agreement with appellants, however, that (rbrief, page 12) it would not have been "obvious to one skilled in the art to employ an electrode in the form of a grating over the feedback region of Sakata et al." The record is unclear as to precisely how the examiner arrives at the recited steps of method claim 12 by modifying Sakata in light of the teachings of Okai. The examiner states (answer, page 4) that "it would have been obvious to one of ordinary skill in the art to place the electrode in the shape of a grating over the feedback (grating) region of Sakata as taught by Okai." If we follow this line of reasoning by the examiner and placed electrodes in the shape of a grating over the feedback region region (119) of Sakata, the conductive pattern that forms the electrodes would have to be deposited upon the upper cladding layer (112). However, claim 12 calls for the conductive material

to be deposited upon the resulting structure of the etching step (e), which is waveguide (103). We are aware of no reason as to why one of ordinary skill in the art would have been motivated to delete the waveguide coupling region that separates the waveguides (111) and (103). If the conducting material were deposited upon the waveguide (103), the serially arranged grating directional couplers of Sakata would not properly couple the light because Sakata utilizes forward coupling (col. 11, lines 65-67) between the upper waveguide (111) and the common waveguide (103). As the two waveguides (103) and (111) of Sakata form an asymmetric directional coupler and mode coupling occurs between the two waveguides (figure 10 and col. 9, lines 1-12) one of ordinary skill in the art would have been taught away from etching down to the waveguide in Sakata. Similarly, we are not in agreement with the examiner's statement (answer, page 9) that "it would have been obvious to one of ordinary skill in the art to substitute the corrugated grating of Sakata with grating shaped electrodes. If we followed this alternate line of reasoning by the examiner, the limitations of claim 12 would not be met for the same reasons we stated, ***supra***, i.e., claim 12 calls for the conductive material to be deposited upon the resulting structure of the etching step (e), which is waveguide (103). If the corregated grating (114) of Sakata were replaced with electrodes shaped as a grating, as advanced by the examiner, the conducting material for forming the electrodes would be deposited upon cladding layer (104). However, to meet method steps (e) and (f) of claim 12, the conductive material would have to be deposited on the waveguide (103). To deposit the conducting material on the waveguide (103), layer

(104) would have to be etched away in the region designed for the formation of a grating, which is contrary to the teachings of Sakata. We therefore conclude that Sakata and Okai do not teach or suggest to one of ordinary skill in the art the method of fabricating a laser structure set forth in claim 12. Accordingly, as the examiner has failed to set forth a ***prima facie*** case of obviousness, we will reverse the rejection of claim 12 under 35 U.S.C. § 103. As claims 2-6, 8-11, and 13 depend from claim 12, and the additional references relied upon by the examiner do not overcome the deficiencies of Sakata and Okai, the rejections of claims 2-6, 8-11, and 13 are reversed.

CONCLUSION

The decision of the examiner to reject claims 2-6 and 8-13 under 35 U.S.C. § 103is reversed.

REVERSED

JAMES D. THOMAS Administrative Patent Judge	)))))) BOARD OF PATENT
LEE E. BARRETT Administrative Patent Judge	) APPEALS) AND) INTERFERENCES
STUART S. LEVY Administrative Patent Judge	))

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APPEAL NO. 1997-3303 - JUDGE LEVY
APPLICATION NO. 08/171,126

APJ LEVY

APJ THOMAS

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DECISION: **REVERSED**

Prepared By:

DRAFT TYPED: 29 Mar 01

FINAL TYPED: